

WHAT IS CLAIMED IS:

1. A vertical machine tool with a movable main spindle
5 comprising:

a base of said machine tool;

the main spindle having an axis directed vertically to a floor
surface and provided at a tip end with a chuck;

a headstock, being movable at least in a first direction in
10 parallel with the axis of said main spindle, for rotatably supporting
said main spindle;

a tool rest provided on said base and on which a single or a
plurality of tools is mounted; and

a splash guard, provided on said base, for covering a machining
15 area of said machine tool,

wherein said headstock or said tool rest is relatively movable in
a second direction perpendicular to the first direction,

one end of a bar workpiece, having a longer axial dimension
than a radial dimension and kept to project at a predetermined length
20 under the condition that the bar workpiece is inserted into said main
spindle, is gripped by the chuck,

said headstock and said tool of said tool rest move relative to
each other to machine the bar workpiece into a predetermined shape,
and a part which has been subjected to the machining is cut off as a
25 machined workpiece in a predetermined position by a cut-off tool, and

wherein said machine tool further comprises:

a bar workpiece supporting means, provided above said
headstock, for supporting the other end of the bar workpiece inserted

into said main spindle, and

a workpiece transfer means provided on said base and receiving the machined workpiece, which has been subjected to the cutting machining, from the chuck and transferring the machined workpiece to
5 an outside of the machining area of said machine tool.

2. A vertical machine tool with a movable main spindle comprising:

a base of said machine tool;
10 the main spindle having an axis directed vertically to a floor surface and provided at a tip end with a chuck;

a headstock, being movable at least in a first direction in parallel with the axis of said main spindle, for rotatably supporting said main spindle;

15 a tool rest provided on said base and on which a single or a plurality of tools is mounted; and

a splash guard, provided on said base, for covering a machining area of said machine tool,

wherein said headstock or said tool rest is relatively movable in
20 a second direction perpendicular to the first direction,

a bar workpiece, having a longer axial dimension than a radial dimension and being kept to project at a predetermined length under the condition that the bar workpiece is inserted into said main spindle, is gripped by the chuck,

25 said headstock and said tool of said tool rest move relative to each other to machine the bar workpiece into a predetermined shape, and a part which has been subjected to the machining is cut off as a machined workpiece in a predetermined position by a cut-off tool, and

wherein said machine tool further comprises:

a cut-off tool holding means, mounted on or changeably provided on said tool rest and holding said cut-off tool, for adjusting a position of said cut-off tool in the first direction for cutting the bar
5 workpiece;

a discharge port, provided in said splash guard, for discharging the machined workpiece to the outside of the machining area; and

a workpiece transfer means, provided on said base and provided with a workpiece receiving member for receiving the machined
10 workpiece from the chuck, for moving the workpiece receiving member to a receiving position for receiving from the chuck the machined workpiece having been cut off by said cut-off tool and to a discharging position corresponding to the discharge port,

wherein the position of said cut-off tool in the first direction is
15 adjustable by said cut-off tool holding means, so that a distance between a lower end of the bar workpiece and a bottom surface of said workpiece receiving member is kept in a predetermined dimensional range when said workpiece receiving member is located at the receiving position and said cut-off tool is cutting the bar workpiece.

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3. The vertical machine tool with a movable main spindle according to claim 2, wherein a collecting box which collects the machined workpiece discharged from the discharge port is provided in a position outside of said splash guard corresponding to a position of
25 the discharge port.

4. The vertical machine tool with a movable main spindle according to claim 2, wherein said splash guard has an opening portion

and an opening and closing door for shielding the opening portion, and the discharge port is provided in the opening and closing door.

5 5. The vertical machine tool with a movable main spindle according to claim 3, wherein said collecting box comprises:

an upper cover fixed on a front surface of the opening and closing door of said splash guard,

a collecting box receiving portion movably provided on said base through a guide portion, and

10 a collecting portion received detachably in said collecting box receiving portion.

6. The vertical machine tool with a movable main spindle according to claim 5,

15 wherein an oil pan for receiving cutting fluid collected in said collecting box receiving portion is arranged to extend longitudinally in the second direction below said collecting box receiving portion,

the oil pan has a dimension longer than a moving range of said collecting box receiving portion and is fixed on said base, and

20 the cutting fluid within the collecting box receiving portion is collected in the oil pan even if the collecting box receiving portion is moved in any position in the second direction.

7. The vertical machine tool with a movable main spindle
25 according to claim 2,

wherein said workpiece receiving member is a bucket,

the bucket is driven to be swingable by a rotary actuator and moves between the receiving position and the discharging position,

the bucket is rotatably supported by a bucket supporting member making a swinging motion so that an opening portion of the bucket is directed upwardly at the receiving position,

the bucket receives from the chuck the machined workpiece
5 which has been subjected to the cutting machining at the receiving position while the bar workpiece gripped by the chuck is cut off by the cut-off tool, and

the bucket is retracted to the discharging position during the turning by the tool, the bucket closes the discharge port at the
10 discharging position, and the machined workpiece received in the bucket is discharged outside of the machining area through the discharge port.

8. The vertical machine tool with a movable main spindle
15 according to claim 7,

wherein the bucket has a predetermined shape such that the bottom surface is narrow and the opening portion is wide, a cam follower is provided to the bottom surface,

the bucket is retained with the bottom surface located down and
20 with the opening portion directed upwardly by the gravitational force at the receiving position, and

at the discharging position, the cam follower is engaged with a slanted surface portion of a cam member fixed to the splash guard, and the bucket is slanted round a pivot of a supporting shaft, so that an
25 edge portion forming the opening portion of the bucket closes the discharge port to thereby shield the machining area from the outside.

9. The vertical machine tool with a movable main spindle

according to claim 2, wherein said cut-off tool holding means comprises:

a base member mounted detachably on a tool mounting portion of said tool rest or being changeable,

5 a holder member, mounted on said base member, for holding said cut-off tool and for adjusting a position in the first direction of said cut-off tool, and

a rotation limiting means, provided between said base member and said holder member, for preventing said holder member from
10 rotating about its axis.

10. The vertical machine tool with a movable main spindle according to claim 9,

wherein said base member is fixed detachably on a turret of
15 said tool rest, a hole having a circular cross-section is formed to penetrate said base member, a key groove is formed to penetrate in the hole in parallel with the axis of said holder member,

a cylindrical fitting portion is formed on said holder member, a key provided on said fitting portion is fitted with the key groove
20 movably in the first direction, and

the key groove and the key form said rotation limiting means.

11. The vertical machine tool with a movable main spindle according to claim 10,

25 wherein a fixing means for fixing said holder member to a desired position in the first direction is provided to said base member and on said holder member,

said fixing means is composed of a single or a plurality of

setscrews engaged with said base member and a fitted portion formed on said fitting portion and depressed by the setscrews, and

the setscrews are arranged in predetermined upper and lower positions and are engaged with internal screws formed to said base member so that the setscrews are easily fastened and loosened.

12. The vertical machine tool with a movable main spindle according to claim 9,

wherein a nozzle for discharging cutting fluid in the vicinity of a tool nose portion of said cut-off tool is provided on said holder member, and

a supply path for supplying the cutting fluid to said nozzle is formed in said holder member and said base member.

13. The vertical machine tool with a movable main spindle according to claim 1, wherein said bar workpiece supporting means comprises:

a workpiece supporting body provided on said headstock; and

a contact member provided movably in the first direction relative to the workpiece supporting body and provided at its lower end with a recess portion engaging with the other end of the bar workpiece inserted into said main spindle,

wherein said contact member always depresses the bar workpiece by a gravitational force of said contact member and supports the bar workpiece.

14. The vertical machine tool with a movable main spindle according to claim 13, wherein the bar workpiece is rotated about the

axis of said main spindle under the both end supported condition in which a lower portion of the bar workpiece is gripped by the chuck and an upper portion of the bar workpiece is always supported by said contact member.

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15. The vertical machine tool with a movable main spindle according to claim 13,

wherein said contact member has a rotary portion having the recess portion formed at a lower end thereof, and a non-rotatable
10 portion arranged above said rotary portion and coupled with said rotary portion,

a bearing portion is provided between said rotary portion and said non-rotatable portion, and

said contact member as a whole is movable in the first direction
15 and only said rotary portion is rotatable together with the bar workpiece.

16. The vertical machine tool with a movable main spindle according to claim 1, wherein said bar workpiece supporting means
20 comprises:

a workpiece supporting body provided on said headstock; and

a contact member provided movably in the first direction relative to the workpiece supporting body and provided at its lower end with a recess portion engaging with the other end of the bar workpiece
25 inserted into said main spindle; and

a driver for driving said contact member,

wherein the bar workpiece is always depressed by said contact member, which is driven by said driver, and the bar workpiece is

supported.

17. The vertical machine tool with a movable main spindle according to claim 1, wherein said headstock is also movable in the
5 second direction.